

Alfalfa Cleans Up Fertilizer Spill

It took the derailment of a Canadian Pacific Railway train on February 20, 1989, near Bordulac, North Dakota, to prove alfalfa's worth in "vacuuming up" excess nitrogen fertilizer.

After several carloads of liquid nitrogen fertilizer spilled, Canadian Pacific hired the Braun Intertec Corp. environmental consulting firm to direct a cleanup. First, a crew removed all the soil around the cars, down to a depth of 4 feet. Groundwater was also pumped and used to irrigate nearby corn and wheat.

"The idea," says Michael P. Russelle, a soil scientist with USDA's Agricultural Research Service in St. Paul, Minnesota, "was to clean the groundwater of excess nitrogen by recycling it through crops that use the nitrogen as fertilizer."

But 7 years later, the groundwater and soil still had excessive levels of nitrogen.

Enter alfalfa, ARS, and North Dakota State University's Carrington Research and Extension Center.

Alfalfa usually obtains its nitrogen from both the soil and atmosphere. But Russelle's work before the spill had shown that a special type of ARS-developed alfalfa, ironically named "Ineffective Agate," took up 30 to 40 percent more nitrogen from soil and water than normal alfalfa.

Russelle, who is in the Plant Science Research Unit, says, "The alfalfa is called ineffective because, unlike standard alfalfa, it forms root nodules that are unable to use nitrogen from the air. So it must get all its nitrogen from water and soil. That made it very interesting to Canadian Pacific Railway representatives."

Ineffective Agate began its work in 1996 and took up 125 pounds of nitrogen per acre, compared to 75 pounds by corn. In 1997, a farmer harvested three cuttings of alfalfa for hay that had removed 380 pounds of nitrogen per acre. Wheat re-



Scene of the 1989 train derailment site near Bordulac, North Dakota, showing some of the rail cars that leaked nitrogen fertilizer.

moved 70 pounds. The cleanup crew pumped about 300,000 gallons of groundwater onto the 7-acre site to irrigate the alfalfa.

Last year, researchers pumped nearly 690,000 gallons. Four cuttings of Ineffective Agate removed 370 pounds of nitrogen per acre.

ARS researchers finished their research role in the cleanup in autumn of 1998 and are summarizing the results. [For an earlier story on this project, see "Novel Alfalfa Cleans Fertilizer Spill," *Agricultural Research*, January 1997, pp. 14-17.]

JoAnn F.S. Lamb, an ARS plant geneticist at St. Paul, is developing ineffec-

tive alfalfa germplasm adapted to other parts of the country and expects to be harvesting seed from possible candidates in summer of 1999.—By **Don Comis**, ARS.

This research is part of Water Quality and Management, an ARS National Program described on the World Wide Web at <http://www.nps.usda.ars.gov/programs/nrsas.htm>

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At the derailment site, soil scientist Michael Russelle and plant geneticist JoAnn Lamb monitor the biological cleanup of nitrogen fertilizer with a unique alfalfa. Yellowing leaves in the foreground indicate an area of cleaner soil.